

# The Creswellian (Pleistocene) human lower limb remains from Gough's Cave (Somerset, England)

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**SYNOPSIS.** The Creswellian human remains include a variety of pieces of the lower limbs, all extremely fragmentary and, with the exception of three metatarsals, disassociated. At least four individuals are represented. The remains are notable mainly for their moderately high femoral neck-shaft angles and their pronounced gluteal tuberosities and associated lateral diaphyseal buttresses.

## INTRODUCTION

The lower limb remains from the Creswellian levels of Gough's Cave are extremely fragmentary. Except for one fibula and three associated metatarsals, there are no complete diaphyseal contours, and none of the articular surfaces are sufficiently intact to provide more than basic identification and a few qualitative details. Moreover, even though multiple individuals are represented (e.g., there are four left proximal femoral fragments with portions of the gluteal tuberosity, indicating that at least four individuals are present), it is not possible to associate pieces by individual (not including cases in which two pieces actually join along a postmortem break, since they are now catalogued as a single element).

Consequently, the following description provides primarily inventory information, combined whenever possible with morphological observations. Very few standard osteometric dimensions can be determined, or even estimated, on these remains.

In the inventory, the current Natural History Museum catalogue number (M.54####) is provided, followed by an excavation number (or numbers when two or more pieces have been joined).

For some of the remains (e.g., the femora and tibiae) sample sizes are sufficient to divide the remains into smaller and larger morphs. These assessments are based on visual inspection of multiple pieces from the same region of the bone and are not strictly quantified.

## PELVIC REMAINS

### Inventory

M.54080 (GC 87 114A)

Right

Internal fragment of an iliac blade just anterior of the posterior superior tubercle and just below the iliac crest. Maximum height: 40.5mm, maximum length: 29.0 mm.

M.54090 (GC 87 224A)

Right

Inferior end of the acetabular lunate surface, with the articular surface and the internal edge around the convex end of the subchondral bone adjacent to the acetabular notch. Maximum length: 21.1 mm, maximum breadth: 22.6 mm.

## Morphology

These two pieces provide little information, other than that there is no apparent degeneration on the M.54090 subchondral bone.

## FEMORA

### Inventory

M.54081 (GC 87 85)

Right

Section of the posterior and medial surfaces of a mid femoral diaphysis, with strong development of the linea aspera and a pilaster. Maximum length: 121.9 mm, maximum breadth: 22.4 mm.

M.54085 (GC 87 13)

Right?

Diaphyseal section which probably represents the lateral popliteal surface with the lateral distal crest of a right femur. Maximum length: 107.5mm, maximum breadth: 26.6mm.

M.54115 (GC 1950–51 Level 12)

Right

Medial neck cortical bone with the adjacent trabeculae, from the proximal flare for the head to the mid-posterior flare for the lesser trochanter and the mid-anterior rugosity for the spiral line (Figs 1, 3). Maximum length: 83.0mm.

M.54116 (GC 87 108A)

Right

Medial cortex and trabeculae of the neck, from close to the head to just distal of the lesser trochanter, with most of the medial side of the base for the lesser trochanter (Figs 2, 4). Maximum length: 97.0mm, maximum breadth (antero-posterior): 27.3mm.

M.54117 (GC 49 Level 14)

Left

Proximal lateral diaphysis, with the edge of the greater trochanter and all of the gluteal tuberosity and buttress (Fig. 5). Maximum length: 159.5mm.

M.54118 (GC 86 14A)

Left

Proximal diaphyseal piece with the distal half of the gluteal tuberosity and buttress. Maximum length: 81.8mm, maximum breadth: 19.7mm.



Figs 1, 2 Posterior views of proximal right femora; 1, M.54115; 2, M.54116.

Figs 3, 4 Medial views of proximal right femora; 3, M.54115; 4, M.54116.

Fig. 5 Lateral view of left femur, M.54117.

Fig. 6 Posterior view of right femur, M.54120.

Figs 7-9 Postero-lateral views of femora; 7, M.54123; 8, M.54145; 9, M.54124.

All figures  $\times 0.95$ .

M.54119 (GC 86 14B)

Left

Proximal lateral diaphysis with the middle of the gluteal buttress and tuberosity. Maximum length: 69.6mm, maximum breadth: 23.3mm.

M.54120 (GC 87 138A)

Right

Proximal diaphysis with the distal half to one-third of the gluteal tuberosity and buttress (Fig. 6). Maximum length: 86.5mm, maximum breadth: 20.4mm.

M.54121 (GC 87 167)

Left

Proximal diaphysis with the distal half of the gluteal buttress and the lateral three-quarters of the gluteal tuberosity. Maximum length: 54.5mm, maximum breadth: 17.9mm.

M.54122 (GC 1986)

Left

Proximal medial diaphyseal piece, with the spiral line and the beginning of the flare for the lesser trochanter, with medial and antero-medial surface bone. Maximum length: 50.3mm, maximum breadth (antero-posterior): 24.6mm.

M.54123 (GC 86 17)

Side indeterminate

Midshaft posterior and medial diaphyseal section with the linea aspera (Fig. 7). Maximum length: 49.0mm, maximum breadth: 23.1mm.

M.54124 (GC 87 200)

Right

Proximal to mid diaphyseal section with the posterior surface and the proximal development of the linea aspera plus the nutrient foramen (Fig. 9). Maximum length: 67.8mm, maximum breadth: 22.6mm.

M.54125 (GC 87 98/176)

Left

Lateral and especially dorsal sides of an adolescent distal femur, with the metaphyseal surface present especially laterally. Maximum length: 86.0mm, maximum depth: 46.0mm, maximum breadth: 62.7mm.

M.54145 (GC 87 79)

Side indeterminate

Late juvenile or early adolescent femoral diaphyseal piece (Fig. 8). Maximum length: 60.0mm.

## Morphology

*Proximal Medial Epiphysis* (Nos. M.54115 & M.54116)

The two pieces represented include a larger morph (M.54116) and a smaller one (M.54115), which are otherwise very similar in their preserved portions (Figs 1–4). They are notable primarily for their implied relatively high neck-shaft angles. On both of them, estimating the proximal diaphyseal and neck axes provides neck-shaft angles in the vicinity of 130° and probably greater than 130°. In this, they are within the range of European late Upper Paleolithic human remains [ $125.0^\circ \pm 5.8^\circ$ ,  $N = 7$  (Trinkaus, 1993)] but towards the upper end of that range.

*Proximal Diaphysis* (Nos. M.54117 to M.54122)

There are five pieces of proximal lateral femoral diaphysis which preserve portions of the gluteal tuberosity and adjacent proximal lateral diaphyseal (or gluteal) buttress, four left and one right and all representing the smaller morph (Figs 5, 6).

All of these pieces are notable for their prominent, rugose, and medio-laterally concave gluteal tuberosities. The available dimensions of these tuberosities are in Table 1, even as minimum dimensions

**Table 1** Gluteal tuberosity dimensions of proximal femora.

	Tuberosity breadth (max.), mm	Tuberosity depth (max.), mm
M.54117	9.0	2.1
M.54118	≥9.5	1.5
M.54119	>8.0	≥2.1
M.54120	≥8.3	≥1.6
M.54121	≥10.2	≥1.8

**Table 2** Cortical thicknesses (in mm) of proximal lateral femoral diaphyses.

	Gluteal buttress maximum	Anterior diaphysis	Antero-lateral diaphysis	Posterior diaphysis
M.54117	10.4	3.8	–	4.8
M.54118	11.3	–	4.5	6.7
M.54119	10.7	–	ca.4.0	3.4
M.54120	ca.11.1	–	4.8	5.1
M.54121	10.3	4.2	–	5.0

for most of the pieces, they are well within the ranges of variation of late Upper Paleolithic humans [ $7.8 \pm 2.0$ ,  $N = 5$  (Trinkaus, 1976)]. The dimensions of these tuberosities become more pronounced when they are placed in the context (albeit qualitatively) of the small dimensions of these diaphyses.

These pieces are also notable for their pronounced proximo-lateral buttresses (Figs 5, 6). The relative dimensions of these buttresses can be assessed in part by comparisons of maximum cortical thickness across the buttress compared to those obtained from adjacent anterior, antero-lateral and posterior diaphyseal bone (Table 2). In all but one case the buttress thickness is more than twice the largest adjacent cortical thickness, and in the exception it is still 69% larger than the posterior diaphyseal thickness.

There is one piece which preserves the medial diaphysis with the spiral line. It has a modest but clear spiral line and exhibits some thickening of the medial cortex. The maximum medial cortical thickness of 8.0mm is slightly larger than those of the adjacent anterior (5.7mm) and posterior (7.5mm) cortical bone. It represents one of the larger morphs.

*Mid Diaphysis* (Nos. M.54081, M.54123 & M.54124)

This region is represented by two diaphyseal pieces of the larger morph (M.54081 and M.54124) and two that are indeterminate as to relative size. One of them preserves the more proximal portion of the posterior midshaft (M.54124) whereas the other two appear to be generally closer to midshaft.

Each of the three specimens (Figs 7, 9, 10) presents a relatively rugose linea aspera, with an adjacent concave lateral subperiosteal diaphyseal surface and the formation of a pilaster. On the specimen with the strongest development of the linea aspera, M.54081, the linea aspera is 8.6mm wide at the level of the nutrient foramen and 11.1mm wide more distally, where it is broken postmortem (Fig. 10). The two specimens with the linea aspera preserved near midshaft present posterior cortical thicknesses (across the linea aspera) of 9.7mm (M.54081) and 9.3mm (M.54123, Fig. 7), which can be compared to a lateral thickness of 5.0mm on the former and a medial one of 5.5mm on the latter.

*Distal Diaphysis* (Nos. M.54085, M.54125)

The two specimens of distal posterior femoral diaphysis present little of note morphologically, and one of them (M.54085) is sufficiently amorphous that its identification as a distal posterior femoral shaft can be questioned.

The more complete specimen (M.54125) is from a late juvenile or early adolescent (Fig. 11), with clear formation of the metaphyseal surface but an uncertain degree (given preservation) of interdigitation between the metaphysis and the epiphysis. The only feature of note is the presence of porous periosteal new bone on the posterior surface above the medial condyle metaphyseal surface, covering an area extending proximally 32.1mm from the epiphyseal line and at least 18.7mm wide (its medial boundary extends beyond the medial postmortem break). Given the isolated nature of this specimen, it remains unclear whether the periosteal reaction is the result of a localized infection or part of a systemic disorder.

## TIBIAE

### Inventory

M.54088 (GC 87 60B)  
Right  
Posterior half of an immature (unfused) medial condyle. Maximum depth: 19.2mm, maximum breadth: 27.2mm.

M.54089 (GC 87 122A)  
Left  
Postero-lateral section of an immature medial condyle. Maximum depth: 25.7mm, maximum breadth: 22.4mm.

M.54091 (GC 87 119E)  
Left  
Diaphyseal section with the interosseus line from just distal of the tibial tuberosity to near midshaft (Fig. 16). Maximum length: 117.8mm, maximum breadth: 18.8mm.

M.54092 (GC 87 76)  
Left  
Midshaft anterior crest, medial surface and a small amount of the lateral surface (Fig. 15). Maximum length: 173.8mm, maximum breadth: 28.5mm.

M.54093 (GC 87 119B)  
Right  
Portion of the posterior diaphysis with the soleal line and the nutrient foramen. Maximum length: 67.5mm, maximum breadth: 27.9mm.

M.54126 (GC 50–51)  
Side indeterminate  
Midshaft section with the anterior crest and the medial side (Fig. 12). Maximum length: 99.2mm, maximum breadth: 31.9mm.

M.54127 (GC 87 43)  
Side indeterminate  
Anterior crest of a midshaft section, with little of the medial or lateral surfaces (Fig. 14). Maximum length: 105.9mm.

M.54128 (GC 87 60D)  
Side indeterminate  
Mid posterior proximal epiphyseal bone, with the irregular surface bone from just below the capsular line. Maximum length: 39.3mm, maximum breadth: 27.6mm.

M.54129 (GC – no number)  
Side indeterminate  
Heavily encrusted anterior midshaft section, which is possibly non-human (Fig. 13).

### Morphology

*Proximal Epiphysis* (Nos. M.54088 & M.54089)  
The two pieces of immature (unfused) medial epicondyle epiphysis

**Table 3** Anterior and medial cortical thicknesses of midshaft tibial diaphyseal fragments. The proximo-distal location of midshaft is approximate given fragmentation. Measurements in millimeters.

	Anterior cortical thickness	Medial cortical thickness
M.54092	12.9	3.2
M.54126	14.6	5.8
M.54127	10.3	–
M.54129	6.9	3.3

present gentle medio-lateral concavities of the articular surface, small and blunt intercondylar eminences, and clear *M. semimembranosus* sulci posteriorly.

*Anterior Diaphyseal Sections* (Nos. M.54092, M.54126, M.54127, M.54129).

The four preserved sections of anterior, approximately midshaft, crest represent two large individuals (M.54092 & M.54126) and two smaller ones (Figs 12–15). They exhibit considerable variability in anterior cortical thickness (Table 3), with the ratio between the maximum anterior and medial thicknesses varying from 2.1 to 2.5 to 4.0. One of the specimens, M.54127, has a relatively sharp anterior margin, whereas the others exhibit clear but blunt anterior crests.

*Posterior and Lateral Diaphyseal Sections* (Nos. M.54091, M.54093 & M.54128)

These three pieces include an otherwise amorphous piece of proximal dorsal diaphyseal surface, a piece of the lateral proximal diaphysis with a very clear and slightly raised interosseus line (Fig. 16), and a proximal dorsal piece with a modest soleal line associated with a clear flexor line between the *M. tibialis posterior* and *M. flexor digitorum longus* proximal origins.

## FIBULA

### Inventory

M.54094 (GC 87 42/54/55)  
Left  
Diaphyseal section, mostly preserving the soleal and peroneal surfaces (Fig. 17). Maximum length: 162.7mm, maximum breadth: 12.4mm.

### Morphology

The fibular diaphyseal piece (Fig. 17) preserves areas for the *M. soleus* and *M. peroneus longus*, but the preserved dorsal surface is smooth and presents no clear muscle markings. Otherwise, the diaphysis appears relatively straight, but it not sufficiently intact to indicate whether there is mid or distal shaft lateral convexity.

Fig. 10 Posterior view right femoral midshaft, M.54081.

Fig. 11 Posterior view of left immature distal femoral metaphysis, M.54125.

Figs 12–15 Anterior views of tibial anterior diaphyseal pieces; 12, M.54126; 13, M.54129; 14, M.54127; 15, M.54092.

Fig. 16 Lateral view of a mid/proximal lateral diaphyseal piece of a left tibia, M.54091.

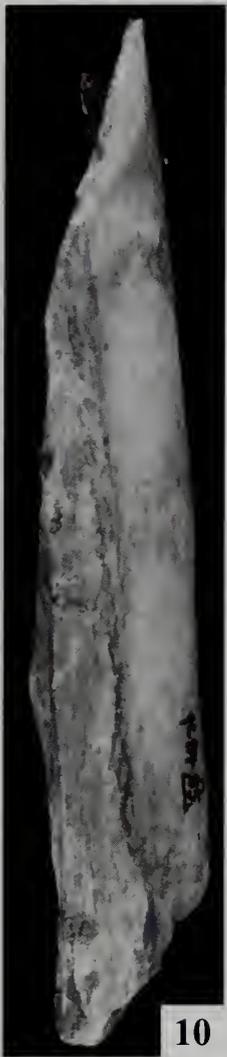
Fig. 17 Posterior view of left fibular diaphysis, M.54094.

Fig. 18 Dorsal view of left anterior calcaneus, M.54095.

Fig. 19 Medial view of medial cuneiform bone, M.54096.

Figs 20–22 Lateral views of left metatarsals 3 to 5; 20, M.54144; 21, M.54097; 22, M.54098.

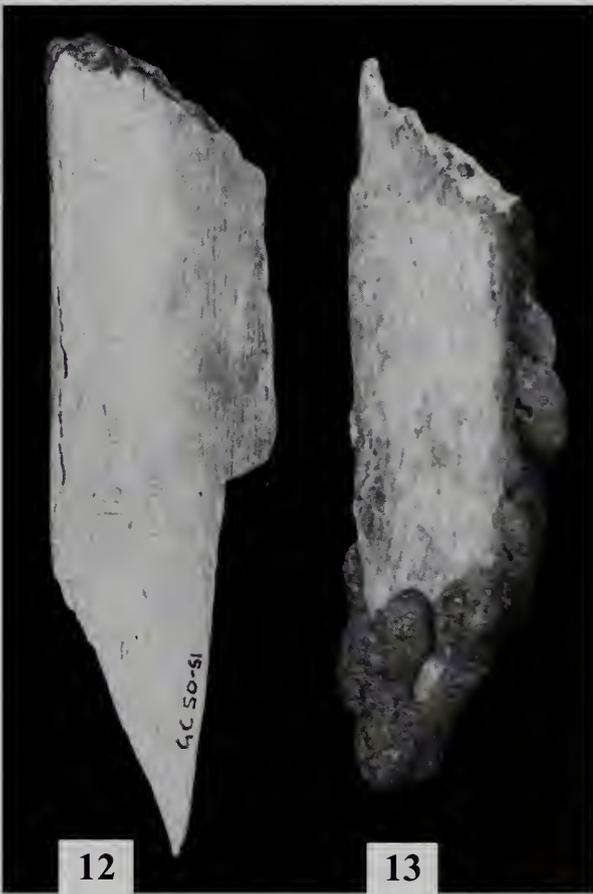
All figures  $\times 0.95$ .



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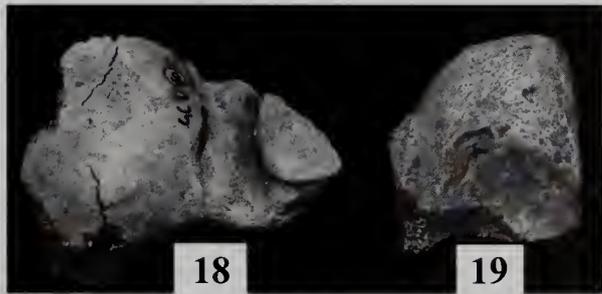


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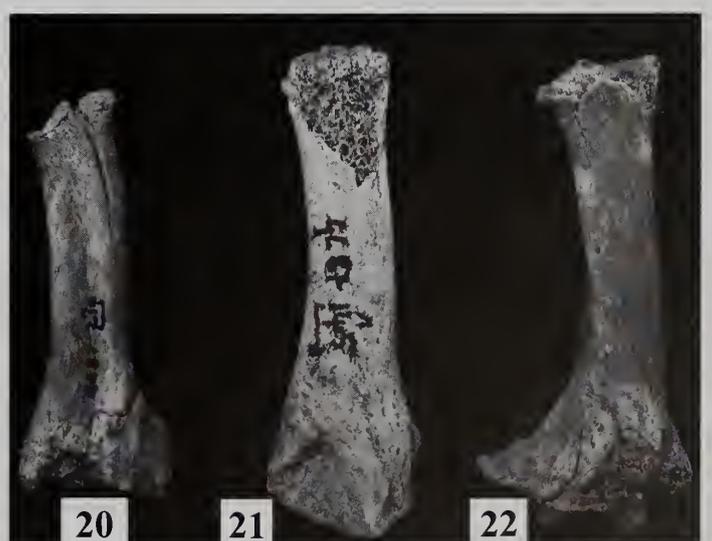


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15



17



20

21

22

**Table 4** Osteometrics and midshaft cross-sectional geometry of the metatarsal proximal epiphyses and diaphyses. Cross-sectional geometric properties are computed from radiographically determined external diameters and cortical thicknesses (corrected for parallax) using ellipse formulae (see Runestad *et al.*, 1993). All measurements in millimeters.

	MT3 -M.54144	MT4 -M.54907	MT5 -M.54098
Midshaft height	9.9	10.0	8.0
Midshaft breadth	6.2	9.0	9.9
Shaft curvature chord <sup>a</sup>			31.1
Shaft curvature subtense <sup>a</sup>			0.8
Total area (mm <sup>2</sup> )	48.2	70.7	62.2
Cortical area	37.9	48.0	44.3
Medullary area	10.3	22.6	17.9
Antero-posterior 2nd moment of area ( $I_x$ ) (mm <sup>4</sup> )	278.9	398.3	224.6
Medio-lateral 2nd moment of area ( $I_y$ ) (mm <sup>4</sup> )	111.5	319.6	354.2
Polar moment of area (mm <sup>4</sup> )	390.3	717.9	578.8
Proximal articular height <sup>b</sup>	-	16.9	-
Proximal articular breadth <sup>b</sup>	-	9.7	-
MT4 facet height <sup>c</sup>	-		11.1
MT5 facet height <sup>c</sup>		12.3	
MT5 facet length <sup>c</sup>		10.0	

<sup>a</sup> Chord and subtense along the medial (or dorso-medial) diaphysis between the epiphyseal swellings, with a positive subtense indicating medial convexity.

<sup>b</sup> Dorso-plantar height and medio-lateral breadth of the tarsal articulation.

<sup>c</sup> Dorso-plantar height and proximo-distal length of the intermetatarsal facets.

## CALCANEUS

### Inventory

M.54095 (GC 87 60C)

Left

Fragment preserving the medial and posterior portion of the posterior talar surface and the posterior portion of the sustentaculum tali and medial articular surface (Fig. 18). Maximum AP: 29.7mm, maximum breadth: 33.3mm.

### Morphology

There is little of morphological note on this piece (Fig. 18), other than that the margins for the posterior and medial talar facets along the sulcus tali appear sharp and distinct, and there is no porosity between them. Although standard osteometrics are not possible, this bone appears to derive from a large individual.

## MEDIAL CUNEIFORM

### Inventory

M.54096 (GC 87 199)

Left

Largely intact bone, with damage to the plantar surface (Fig. 19). Maximum antero-posterior length: 22.2mm, maximum dorso-plantar height: 23.1mm.

### Morphology

The one surface of note on this specimen (Fig. 19) is its metatarsal 1 facet, which is smooth, medio-laterally flat, and shows no sign of being divided into dorsal and plantar portions. Its superior length is 20.0mm and its middle length is 20.6mm.

## METATARSALS

### Inventory

M.54144 (GC 87 30)

Left

Metatarsal 3 diaphysis with the proximal epiphysis largely lost to damage and the distal epiphysis unfused and lost (Fig. 20). Maximum length: 51.7mm.

M.54097 (GC 87 145)

Left

Metatarsal 4 diaphysis and damaged proximal epiphysis, missing the unfused distal epiphysis (Fig. 21). Maximum length: 57.8mm.

M.54098 (GC 87 210)

Left

Metatarsal 5 diaphysis lacking the unfused distal epiphysis and most of the proximal epiphysis to damage (Fig. 22). Maximum length: 47.1mm.

### Morphology

The three preserved metatarsal specimens derive from the same foot (Table 4; Figs 20–22). They show little muscular marking, possibly due to their immature status. The metatarsal 4 and 5 diaphyses are relatively round, and the metatarsal 5 diaphysis presents little medial diaphyseal convexity.

## DUBIOUS FRAGMENTS

The following diaphyseal fragments have been included with the human material. They are either clearly non-human or so fragmentary as to be insufficient to determine whether they are human. They do not provide morphological information even if they are in fact hominid, and are therefore not included in the above descriptions, but are listed here for future reference.

<i>Cat. no.</i>	<i>Excavation no.</i>
M.54082	GC 87 154
M.54083	GC 87 221A
M.54084	GC 87 110
M.54086	GC 16 1950-51
M.54099	GC 87 5
M.54100	GC 87 40
M.54101	GC 87 153B
M.54102	GC 87 118C, GC 87 118D
M.54103	GC 87 122I, GC 87 122J
M.54104	GC 87 123A
M.54105	GC 86 23
M.54106	GC 87 226C
M.54107	GC 87 173A
M.54108	GC 87 173-B
M.54109	GC 87 173-C
M.54110	GC #1021.0
M.54111	GC 86 6 #1002.0
M.54112	GC 89 001
M.54113	GC 89 016
M.54114	GC 87 165B

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